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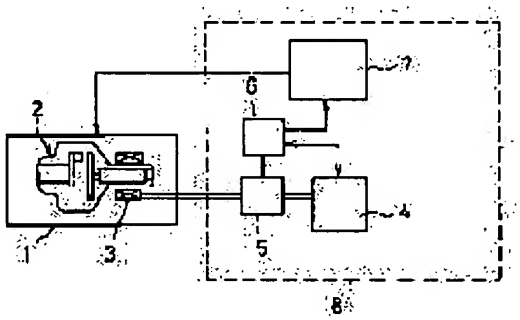
(54) CONTROL DEVICE FOR ROTARY ANODE X-RAY TUBE

(57)Abstract:

PURPOSE: To provide a rotary anode X-ray tube control device having the capability of accurately detecting an abnormal deviation in the number of rotations of an anode target, and improving protective performance corresponding to the number of rotations.

CONSTITUTION: This rotary anode X-ray tube control device is such that there is provided a rotary anode X-ray tube control device supplying drive power from a power circuit 8 to a rotary anode X-ray tube device comprising a three- phase wound stator coil mounted rotary anode X-ray tube 2 housed in a tube container 1. Coil current from the circuit 8 to a stator coil 3, reactive power or a power factor is detected and a comparison is made with a corresponding value at the predetermined number of rotations of an anode target. When there is any deviation from a set value, exceeding the predetermined range, the supply of high voltage to the X-ray tube 2 is interrupted.



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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to a rotating anode X-ray tube control unit.
[0002]
[Description of the Prior Art] Conventionally, rotating anode X-ray tube equipment is constituted as shown in drawing 4 , and the rotating anode X-ray tube 2 is held in the tubing container 1. It is equipped with the stator coil 3 for constituting an induction motor as a means to drive this rotating anode X-ray tube 2, and this stator coil 3 is connected to the inverter type drive circuit 4 out of the tubing container 1.

[0003] Usually, the stator coil 3 has condenser type single-phase induction motor coil structure which consists of a main coil and an auxiliary coil. It is difficult to acquire a perfect turning circle field in all electrical potential differences and frequency domains in the case of this method, and since there are vibration of the rotating-anode target resulting from an ununiformity field and un-arranging [which the noise tends to generate], the three-phase-circuit wound-rotor-type-induction-motor coil structure where a perfect turning circle field is acquired as a coil method of a stator coil 3 is attracting attention in recent years.
[0004]
[Problem(s) to be Solved by the Invention] When X-ray exposure actuation is performed in the condition that the rotational frequency of the anode plate target does not reach a certain default value in the case of a rotating anode X-ray tube, there is a problem that some anode plate targets dissolve. Therefore, although the proposal of acting as the monitor of the rotational frequency of an anode plate target with a photo sensor or a vibration meter is also made, a certain thing understands plentifully practical difficulties, like rotating anode X-ray tube equipment becomes complicated. Moreover, although the method which acts as the monitor of the coil current is comparatively simple, correspondence with a current value and the rotational frequency of an anode plate target is not so clear. Furthermore, although the judgment of failure of a stator coil 3 and a drive power source is possible, as a protection feature according to a rotational frequency, it is inadequate.
[0005] This invention solves above un-arranging, detects an unusual gap of the rotational frequency of an anode plate target with a sufficient precision, and aims at offering the rotating anode X-ray tube control unit which improved the protection feature according to a rotational frequency.
[0006]
[Means for Solving the Problem] In the rotating anode X-ray tube control unit with which this invention supplies drive power to the rotating anode X-ray tube equipment with which it comes to hold the rotating anode X-ray tube with which it was equipped with the three-phase-circuit coil mold stator coil in a tubing container from a power circuit The coil current from a power circuit to a three-phase-circuit coil mold stator coil, reactive power, or a power-factor is detected. As compared with the value at the time of the predetermined rotational frequency of an anode plate target, when the gap more than the convention range from the set point arises, it is the rotating anode X-ray tube control unit which is

constituted and becomes so that the high-voltage input from a power circuit to a rotating anode X-ray tube may be severed.

[0007]

[Function] According to this invention, an unusual gap of the rotational frequency of an anode plate target is detected certainly, and becomes controllable [X-ray exposure].

[0008]

[Example] Hereafter, one example of this invention is explained to a detail with reference to a drawing.

[0009] In order to solve un-arranging [of the conventional example], the artificer paid his attention to the relation between a rotating anode X-ray tube and the power consumed with a three-phase-circuit wound rotor type induction motor. Namely, an anode plate rotational frequency is detected by acting as the monitor of the power, and when a power value becomes beyond a certain set point, X-ray exposure should just be stopped also at the time of stationary rotation, at the same time it restricts X-ray exposure until it becomes below the value with which this power was beforehand set up at the time of anode plate rotation starting.

[0010] then, the block diagram in which it is constituted so that the rotating anode X-ray tube control device by this invention may be looked like [drawing 1 - drawing 3] and it may be shown, and drawing 1 shows a rotating anode X-ray tube control device, the characteristic curve sheet in which drawing 2 shows time amount change of the rotational frequency of the anode plate target at the time of full voltage starting, power consumption, and a coil current, and drawing 3 are the characteristic curve sheets showing time amount change of the rotational frequency of the anode plate target at the time of stationary rotation, power consumption, and a coil current.

[0011] That is, if the same part as the conventional example (drawing 4) will attach the same sign, a rotating anode X-ray tube 2 is held in the tubing container 1, and this rotating anode X-ray tube 2 is equipped with the stator coil 3 of a three-phase-circuit coil mold. This stator coil 3 is connected to the power detector 5 of the power circuit 8 out of the tubing container 1, and this power detector 5 is connected to the setting comparator circuit 6 while connecting with the inverter type drive circuit 4. This setting comparator circuit 6 is connected to the X-ray exposure control unit 7 while connecting with the inverter type drive circuit 4. And this X-ray exposure control unit 7 is connected to the tubing container 1. Now, at the time of actuation, it acts as the monitor of the power supplied to the stator coil 3 of a three-phase-circuit coil mold in the power detector 5, and it is sent to the setting comparator circuit 6 as a signal at it. The power set point of the setting comparator circuit 6 is adjusted according to the electrical potential difference of the inverter type drive circuit 4, a frequency, and the rotation property of a rotating anode X-ray tube 2, and a limit signal is impressed to the X-ray exposure control unit 7 so that an X-ray exposure signal may not be taken out above this set point. Of course, after starting, about 0.5 to 1 second, irrespective of the existence of this signal, it cannot be overemphasized to X-ray exposure control unit 7 self that an interlocking device is the need so that an X-ray exposure signal may not come out.

[0012] Moreover, in order to raise the number of rotations besides intercepting X-ray exposure according to this amount of power detection to beyond default value, it is in tolerance at the time of stationary rotation, and it may raise the electrical potential difference of the inverter type drive circuit 4, and a frequency.

[0013]

[Effect of the Invention] According to this invention, the coil current from a power circuit to a three-phase-circuit coil mold stator coil, reactive power, or a power-factor is detected. Since it is constituted as compared with the value at the time of the predetermined rotational frequency of an anode plate target so that the high-voltage input to a rotating anode X-ray tube may be severed when the gap more than the convention range from the set point arises Without establishing a special rotation detection means, by acting as the monitor of the coil power (reactive power, power-factor), an unusual gap of the rotational frequency of an anode plate target can detect certainly, consequently it becomes controllable [X-ray exposure].

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CLAIMS

[Claim(s)]
[Claim 1] In the rotating anode X-ray tube control unit which supplies drive power to the rotating anode X-ray tube equipment with which it comes to hold the rotating anode X-ray tube with which it was equipped with the three-phase-circuit coil mold stator coil in a tubing container from a power circuit The coil current from the above-mentioned power circuit to the above-mentioned three-phase-circuit coil mold stator coil, reactive power, or a power-factor is detected. The rotating anode X-ray tube control unit characterized by being constituted and becoming so that the high-voltage input from the above-mentioned power circuit to the above-mentioned rotating anode X-ray tube may be severed as compared with the value at the time of the predetermined rotational frequency of an anode plate target, when the gap more than the convention range from the set point arises.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The block diagram showing the rotating-anode X-ray control equipment concerning one example of this invention.
[Drawing 2] The characteristic curve sheet showing time amount change of the rotational frequency of the anode plate target at the time of full voltage starting in the rotating anode X-ray tube control unit of this invention, power consumption, and a coil current.
[Drawing 3] The characteristic curve sheet showing time amount change of the rotational frequency of the anode plate target at the time of stationary rotation, power consumption, and a coil current similarly.
[Drawing 4] The block diagram showing conventional rotating-anode X-ray control equipment.
[Description of Notations]
1 [-- An inverter type drive circuit 5 / -- A power detector, 6 / -- A setting comparator circuit, 7 / -- An X-ray exposure control unit, 8 / -- Power circuit.] -- A tubing container, 2 -- A rotating anode X ray tube, 3 -- A stator coil, 4

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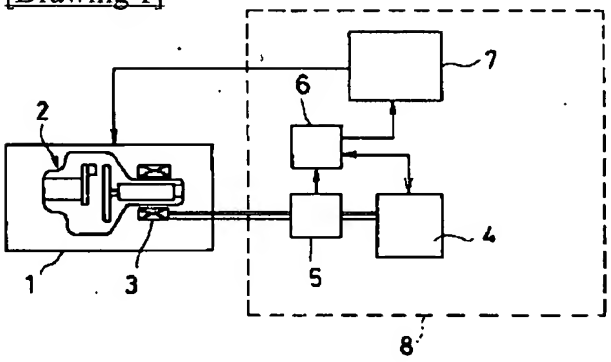
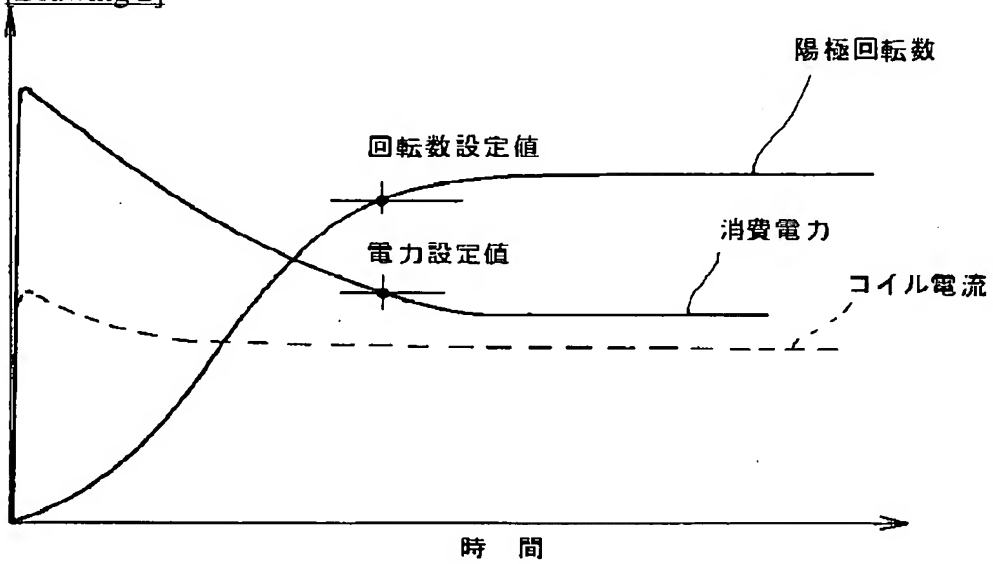
DRAWINGS

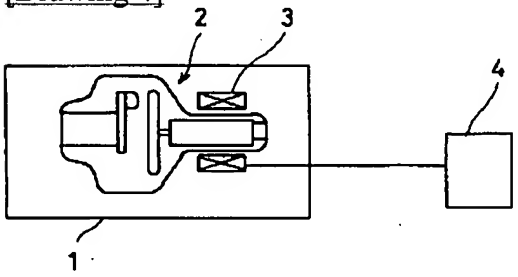
[Drawing 1]



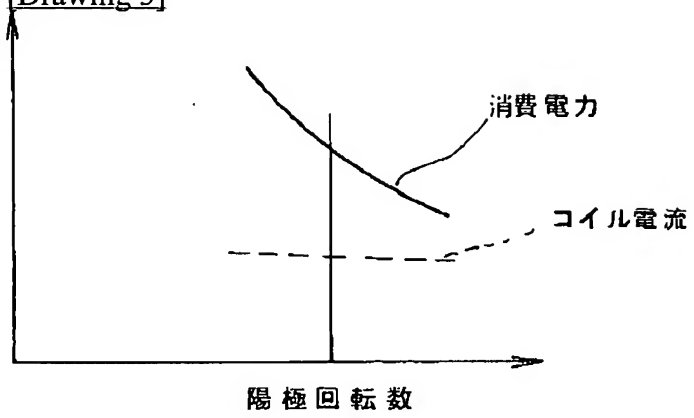
[Drawing 2]



[Drawing 4]



[Drawing 3]



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